

Extratropical cyclones and gales.—While there was some movement of depressions in middle and higher latitudes, according to the rather limited ships' reports over a great area, stormy weather seems to have been extraordinarily infrequent for the season. Two gales were reported, both of force 8. One was experienced near 40° N., 177° E. on the 11th; the other west of southeastern Alaska on the 15th.

Tropical cyclones—Typhoons.—Subjoined is a report by the Rev. Bernard F. Doucette, S. J., Weather Bureau, Manila, P. I., on five typhoons and two depressions that occurred in the Far East during September.

Further, concerning the typhoon of the 7th to 17th, a vessel east of Hong Kong entered the fresh-gale area of the cyclone on the 14th and left it on the 16th. While the storm was changing its course and moving slowly, the observer reported that the "vessel was within the radius of hurricane force winds for 50 hours." The ship's lowest barometer was 983.7 millibars (29.05 inches) on the morning of the 16th, near 22½° N., 116½° E.

In connection with the typhoon of September 12–20, a vessel close to the center of the storm on the 15th, near 24½° N., 133° E., had an uncorrected barometer of 979 millibars (28.91 inches) and a northeast wind of force 10 at 7 a. m., followed by a hurricane wind from the south later in the day.

Cyclones west of Mexico.—While there are evidences of localized, unsettled weather conditions that threatened development into cyclones on other occasions, at least two hurricanes are known to have occurred in Mexican west coast waters, one on about the 8th to 12th; the other on about the 17th to 20th.

The earlier was first reported by a ship having a moderately depressed barometer on the 8th and a northeasterly gale of force 8, near 20° N., 107° W. On the 9th another vessel, a few miles to the northwestward, had a northwest gale of force 10, with lowest barometer at 1,001.4 millibars (29.57 inches). The storm was then moving slowly toward the Gulf of California. On the 13th a press report from Mexico City told of the destruction wrought by it. Quoting:

The fiercest cyclone of this century for 48 hours, ending at noon yesterday, thrashed the southern end of the peninsula of Lower California. It demolished the towns of Santiago and Triunfo, causing 15 deaths and injuring many others. The wind, which reached an intensity of 85 miles an hour, completely demolished the poorer section of La Paz and razed villages near the city.

The highways of Lower California are reported to have been seriously damaged by the torrential rains, which abated somewhat tonight, leaving estimated thousands homeless.

In reporting on the second hurricane, one vessel quoted radio messages as stating the storm was central in 12° N., 100° W., on the 17th and near 14° N., 101° W., on the 18th, while another disturbance was then near 15° N., 111° W. An advisory on the 19th said the two disturbances had merged into a storm of considerable intensity near 17° N., 105° W. The ship quoting the advisories headed into the strong easterly winds on the north of the disturbance at 8 a. m. ship's time, of the 19th. At 1 p. m. the squalls became heavy and the barometer was falling rapidly, and at 2 p. m., amid hurricane gusts and practically zero visibility, some damage was done to the ship. Between 2:30 and 4 p. m. said the report of the second officer:

The barometer fell so rapidly that it could be seen moving down—from 29.25 to 27.67. At 4:30 the ship passed through the center of the cyclone. The wind died down to almost 0 and the low clouds opened up so that high cirrus could be seen through a small opening. There was a peculiar yellow light and the sea became bright green in color. The extremely low atmospheric pressure caused discomfort in the ears. High confused swells broke aboard the ship with

terrific force from all sides. In about 10 to 15 minutes the center passed and the wind came from the southwest, force 12 and over.

The reading 27.67 inches, occurring in 20° N., 107° W., is the second lowest barometer recorded in any hurricane in these waters. The lowest reading, 27.45 inches, occurred in the hurricane of October 25, 1939, in practically the same position, about 20° N., 106° W.

The storm advanced into the Gulf of California on the 20th, and at 4 p. m. of that date a vessel near 22° N., 110° W., had a west-northwest gale of force 11, barometer 992.2 millibars (29.30 inches). Nothing is known definitely regarding the subsequent history of the cyclone.

On the 21st and 24th westerly winds of force 7, with some barometric depression, south to southwest of the Gulf of Tehuantepec, indicate further disturbed weather, although accompanied by no known cyclonic development.

Fog.—Scattered fogs occurred in higher latitudes of the Pacific, but the only interesting occurrence is that of a vessel that entered fog on the 14th near 45° N., 170° E., remained in it without a break for two or three days, then observed it intermittently until the 19th, near 46° N., 162° W. Fog was reported on 4 days off the Oregon coast and on 13 days off the California coast.

TYPHOONS AND DEPRESSIONS OVER THE FAR EAST

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Typhoon, August 31—September 5, 1941.—The first indications of the formation of this storm were the pressure falls at stations along the eastern coast of Luzon, namely the regions about 60 or 70 miles northeast of Manila. On the morning weather map of August 31 there were certain signs of a typhoon forming rather close to the coast, or perhaps one that had formed some distance away and was moving rapidly toward Luzon. In the afternoon, the observations clearly showed the storm center to be about 60 miles east of Baler, Tayabas Province, small, but moving rapidly. During the night the center crossed Luzon, passing south of Casiguran and north of Baler, (both in Tayabas Province) north of Cabanatuan, North Ecija Province, and entered the China Sea via Lingayen Gulf, moving between Dagupan, Pangasinan Province, and Baguio, Mountain Province. Over the China Sea, the storm moved west-northwest, then west, to Hainan Island. Here it changed to the northwest, crossed the Gulf of Tong King, and disappeared over the continent on September 5.

Over the Philippines, August 31, the stations along the course of the storm reported pressure values between 747 mm. (995.9 mb.) and 750 mm. (999.9 mb.) with winds rather weak, considering the situation, the highest being force 6. This is due most likely to the sheltering effect of the mountains. No serious damage was reported, nor were any casualties mentioned in the Manila newspapers.

The upper winds over Cebu and Zamboanga were from the southwest and west quadrants, with velocities seldom reaching 30 k. p. h. Over Manila, the southwesterly current was as high as 45 k. p. h. on August 31 and September 1. Dagupan reported northwesterly winds up to 100 k. p. h. August 31, afternoon ascent, which was the only ascent possible during the course of the storm over Luzon. On September 1, Aparri, Cagayan Province, had winds aloft from the southeast quadrant with velocities as high as 100 k. p. h. These pilots indicate that there was much more activity aloft than at the surface stations protected by neighboring hills and mountains.

Typhoon, September 1-7, 1941.—This typhoon is supposed to have formed far to the east of the eastern Caroline Islands, and then moved along a northwesterly course. At the observatory, the first knowledge of its existence came with the following observation and message, dated September 1 from a ship:

0015 G. C. T., position 17° N. 157° $55'$ E., bar. 29.30 rising; wind estimated 90 miles per hour, varying southwest to south; mountainous seas; heavy rain; passed through center 2130 G. C. T., barometer 29.10 at center.

From this day on, there were no observations available to locate the storm center. Then, on September 4 and 5, Bonin Islands came under the influence of the storm, and observations showed that the course was changing from northwesterly to northerly, the center passing about 60 miles northeast of the station during the forenoon of September 5. The storm then moved very rapidly toward the ocean regions east of central and northern Japan, recurved to the north-northeast and passed beyond the region of observation September 7. The lowest pressure value reported from the Bonins was 743.5 mm. (990.7 mb.), September 5, 5 a. m. (Manila time), with wind force 12, from the northwest. A ship came under the influence of this typhoon. The minimum pressure experienced was 739.9 mm. (986.5 mb.) near latitude $34^{\circ}43'N.$, longitude $146^{\circ}43'E.$, with south-southeast winds of force 11, September 6, 5 a. m. ship's time.

Depression, September 1-5, 1941.—A low-pressure area moved northwesterly from the regions between Guam and Yap to a position about 450 miles east-northeast of San Bernardino Strait, where, as a depression, it inclined to the north and disappeared. It was a storm of minor importance according to available data.

Typhoon, September 7-17, 1941.—A low-pressure area, which appeared about 300 miles west of Guam, September 7, moved westerly and quickly intensified to typhoon strength on September 9, when about 500 miles east of San Bernardino Strait. Moving northwesterly, it reached a position almost directly east of the Balingtang Channel, and then it shifted to a westerly course inclining to the west-southwest and southwest as the center approached Luzon. September 12, during the forenoon and afternoon, the storm crossed northern Luzon, and changed its course to the west-northwest as it entered the China Sea about 30 miles south of Vigan, Ilocos Sur. Then it progressed across the China Sea, moving west-northwest and, inclining to the north-northwest, reached the locality of Hong Kong. The storm seemed to be about to enter the continent close to and east of Hong Kong, but a sudden shift of its course to the west carried the center close to and south of the colony (September 16). On September 17, there were slight indications of the typhoon about 200 miles west-northwest of Hong Kong and on September 18 it was certain that the storm had disappeared over the continent.

Over northern Luzon, September 12, pressure values had fallen to 747 mm. (995.9 mb.) with weak winds, that is, force 3, 4, and 5. The usual weakening of a storm center as it passed over the mountains, was evident and the stations, reporting from sheltered localities, had only pressure values to indicate that the storm was powerful. There were no lives lost; at least there were none reported in the newspapers. Considerable damage by rain to crops, partly matured, was reported. On September 16, when the center was close to Hong Kong, 742.1 mm. (989.4 mb.) was the lowest value received for synoptic purposes. (The real minimum value had not been received at Manila at the time this article was prepared.) Hurricane winds in Hong Kong harbor caused four ships

to be beached, and the loss of a few lives, almost all of these casualties occurring near the shores where the high waves flooded the streets.

Upper winds over Philippine stations were similar to those during the typhoon of August 31–September 5. Cebu and Zamboanga were reporting winds from the southwest quadrant, but the velocities increased to values as high as 100 k. p. h. at Cebu on September 12, but at Zamboanga 55 k. p. h. was the maximum, September 11. In general, Zamboanga was much weaker than Cebu during the period under consideration. Manila had velocities of 115 k. p. h. on September 13, when the typhoon was over the China Sea. Dagupan and Aparri reported very few ascents during these days, because of poor weather conditions. Stations of Indochina and Thailand reporting during this typhoon indicated that the southwesterly current over the southern part of the China Sea was weak, hardly ever reaching values of 50 k. p. h. Also, the reports from northern Indochina seem to show that there was a strong northerly current flowing from the interior of China. This is probably due to the typhoon center near the Nansei Islands at the time (typhoon, September 12–20) which was quite deep, and coastal stations indicated a vigorous flow of air from the north. This current of air seems to have been the controlling factor with regard to the shifting of the course of the typhoon center over the northern part of the China Sea, as it approached and passed Hong Kong.

Typhoon, September 12-20, 1941.—A weak low-pressure area appeared west of the Mariana Islands on September 12, and moved northwesterly. On September 15, it had intensified to typhoon strength (which may have occurred before, but no data have been received to indicate it). This typhoon moved slowly along a north-northwesterly course toward the locality of Borodine Island (Nansei Islands) where it recurved to the northeast. It moved rapidly along this course and was beyond the region of observation September 20. On September 16, 2 p. m. (Manila time), Borodine Island reported a barometer of 732 mm. (975.9 mb.) with north-northeast winds force 5. This observation was made when the center was close to and east of the station, just about to recurve. During these days (September 14 and following) there was a vigorous northerly current over China with considerable rise of pressure, most likely a preliminary tendency toward the formation of the Siberian HIGH.

Depression, September 24-29, 1941.—This depression formed about 450 miles east of Surigao Strait, moved west-northwest to Samar Island, and then moved across the Visayan Islands along a westerly course. It inclined to the northwest in the China Sea and disappeared over the regions 300 miles west of central Luzon. It was a storm of minor importance throughout its course.

Typhoon, September 24-October 3, 1941.—There seemed to be a low pressure area far to the southeast of Guam during the few days before September 25, on which date the morning weather map had definite evidence of a depression central about 300 miles south of Guam. This disturbance moved along a west-northwesterly course, becoming a typhoon on September 26. When the center was about 500 miles east of northern Luzon, near latitude 18° N., longitude 131° E., it shifted its movement to a northerly course (September 29), and rapidly approached Kiusiu Island. It crossed this island October 1 and then recurved to the northeast, passing over northern Japan October 2 on its way to the regions south of the Aleutian Islands.

This disturbance was known to be severe on September 27, when a ship reported from latitude $12^{\circ}54'N.$, longitude $139^{\circ}54'E.$, a pressure of 747.1 mm. (996.0 mb.) with south-

east winds force 8. When the center was over Kiusiu Island, October 1, the afternoon observations from Miyazaki were 728.0 mm. (970.6 mb.) with southeast winds force 9, and from Kagoshima, 727.0 mm. (969.3 mb.) with northwest winds force 6. Newspaper reports in the Manila press of October 2, had an account of the loss of 100 lives in Kiusiu Island due to the typhoon. Many more, fishermen mostly, were missing and a greater total was expected. Property damage amounted to many millions of yen.

The upper winds over Guam were from the east quadrant September 22 and following days, veering to the southeast and increasing to values between 30 and 60 k. p. h. September 25 to 27, as the center passed southwest of the station. Over the Philippines, Aparri, Dagupan, and Manila remained in an easterly (sometimes northeasterly) current until September 30. Cebu and Zamboanga, however, were always reporting winds aloft from the northwest and west quadrants, velocities below 35 k. p. h. until September 28, when an increase to values as high as 70 k. p. h. from the southwest quadrant took place. These high velocities were reported from Cebu more than from Zamboanga, the latter station being consistently in a weaker air stream than Cebu. On these days, September 27 and following, there was a vigorous north quadrant current over China and the northern part of the China Sea. It was also manifested in a few ascents reported from stations of northern Indochina. From the few reports received from Thailand, it seems that these velocities of 50 k. p. h. and higher did not prevail over the southern part of the China Sea and adjacent regions. There was enough evidence during these days to show that two currents of air were interacting over the China Sea, which resulted in the formation of a secondary disturbance described below.

Typhoon, September 30–October 2, 1941.—The first information of this typhoon was the report sent by a ship on September 30, 8 a. m. (Manila time) from latitude 12°17' N., longitude 118°58' E., pressure 741.8 mm. (988.9 mb.) and east winds, force 8. At the same time, Culion, Palawan Province, about 80 miles away, had values varying between 752 and 754 mm. (1,000.5 and 1,005.0 mb.) following the normal daily oscillation. This small typhoon moved northerly about 200 miles and inclined to the northeast as it entered central Luzon over the southern part of Zambales Province. It was weakening as this happened (afternoon hours, October 1), and became a rather shallow depression as it moved over the plains of central Luzon. Over the Pacific Ocean, it moved either east-northeast or northeast to the regions about 200 miles east of Balingtang Channel, where it disappeared.

The storm was violent over a small area and caused considerable damage to the western shores of Mindoro Island and Batangas Province. At Calatagan, Batangas Pr. (a town about 5 miles north of Cape Santiago, Verde Island Passage), the pressure fell to 738 mm. (983.9 mb.) about 5 a. m. October 1. The winds were always from the west, with no lull, and increasing from 1 a. m. to 5 a. m., then decreasing after 6 a. m.

This typhoon weakened quickly because of two reasons. The first reason was the topography, namely the mountains and hills of Zambales Province. The other reason was the deflection of the northerly current of air, flooding the China Sea, into the southern part of the typhoon circulation. This checked the flow of air from the southern part of the China Sea, which was weak, as explained in the previous typhoon account.

Two lives were lost because of this typhoon. Considerable property damage resulted because of the winds and

the rain (90 percent of the houses at Calatagan were destroyed), and two rather large ocean-going vessels suffered damage when they were blown ashore.

RIVER STAGES AND FLOODS

By BENNETT SWENSON

Outstanding during September was the continued drought in Eastern States and the continuation of above-normal precipitation west of the Mississippi River. River stages were unusually low in most sections east of the Mississippi River, and in some cases approached or exceeded the lowest stages of record. On the other hand, stages were above normal in most western sections with floods occurring in a belt extending from southeastern New Mexico northeastward to Minnesota and northern Wisconsin. Noteworthy were the damaging floods which occurred in the Pecos River and the Rio Hondo in the vicinity of Carlsbad and Roswell, N. Mex., the rivers and streams in northern Wisconsin, and in portions of the Solomon, Big Blue, Smoky Hill, and Neosho Rivers in Kansas. Floods occurred also in the Canadian River in New Mexico and Oklahoma, the Republican River in Nebraska and Kansas, and rivers and streams in northeastern and southwestern Iowa, and southeastern Nebraska.

Atlantic Slope drainage.—River stages were unusually low, approaching, or exceeding, the lowest stages of record in many cases, due to the drought conditions.

The stages in the Susquehanna River approached the lowest of record, but did not equal or exceed the lowest in 30 or 40 years of record. The Delaware River at Trenton, N. J., was below zero from September 13 to the end of the month. In the south, the rivers of the Altamaha system were low throughout the month. At Charlotte, Ga., the Altamaha River reached a low stage of only 0.5 foot above the lowest stage of record, while at Doctortown, Ga., it equaled the lowest of record, -2.3 feet. At Dublin, Ga., the Oconee River reached a stage of 0.7 foot, just 0.1 foot above the lowest of record.

Ohio Basin.—The Tennessee River was low and, under control of the Tennessee Valley Authority dam system, the range in stage at Johnsonville, Tenn., was only 1.7 feet (2.3 to 4.0 feet). The precipitation recorded at Asheville, N. C., during September, 0.28 inch, was the lowest of record. In the Ohio River, the dams were up generally throughout the month.

Upper Mississippi Basin.—Exceptionally heavy rains on August 29, 30, and 31, in the upper Chippewa and Wisconsin River Basins and also in the Lake Superior drainage in northern Wisconsin, resulted in devastating floods in that area. Maximum stages of record were exceeded in the upper Chippewa and the extreme upper Wisconsin River basins. Total losses from the flooding in the Chippewa Basin alone have been estimated at more than \$1,000,000. The La Crosse, Wis., office makes the following comments on the flood in the Chippewa River:

Source of Flood.—On August 29, 30, and 31, excessive and unusually heavy rains fell in the upper Chippewa Basin with maximum intensity and focal point in the northeastern part of Sawyer County. Rains of 60-hour duration in this particular locality amounted to more than half the average season precipitation. An average of over 10 inches fell in Sawyer County and approximately 15 inches in the most intense area. In the lower Chippewa Valley the rains from Durand, Wis., to the mouth of the river were comparatively light. The heavy rain area extended eastward into the upper Wisconsin drainage area and westward into the upper St. Croix Basin. The arithmetical average of 33 stations in the Chippewa drainage of 9,010 square miles was 7.00 inches for a period of 3 days. Approximately 500 square miles received 14 inches; 600 square miles, 12 inches; 600 square miles, 10 inches; 1,500 square